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"SITE ASSESSMENT OF SURFACE CONDITIONS -UPPER  
OTTAWA STREET LANDFILL SITE."





THE REGIONAL MUNICIPALITY OF HAMILTON-WENTWORTH

## **SITE ASSESSMENT OF SURFACE CONDITIONS**

**Upper Ottawa Street Landfill Site**

**DRAFT  
FOR REVIEW**

URBAN M

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PROJECT

GOVERNMENT DOCUMENTS



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October 23, 1987

Reference No. 2184-30

Mr. G.S. Spencer  
Director, Engineering Services  
The Regional Municipality of  
Hamilton-Wentworth  
71 Main Street West  
Hamilton, Ontario  
L8N 3T4

Dear Mr. Spencer:

Re: Site Assessment of Surface Conditions  
Upper Ottawa Street Landfill Site

FILE NO.	.....
LETTER NO.	.....
DEC	.....
<b>OCT 26 1987</b>	
ROUT	.....
ENV. SER	..... BY
ENG. SER	.....
TRANS.	..... ANS. BY
REG. SER	..... LED BY
LAB	.....
DL	.....

Enclosed for your review and comment are two draft copies of the above-mentioned report.

As discussed with Mr. G. Dykman, Conestoga-Rover & Associates Ltd. (CRA) can provide further technical detail and cost estimates for the remedial activities recommended within, should this information be required.

Should you have any questions regarding this report, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Gregory D. Ferraro, P. Eng.

GDF/cd  
encls.



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## 1.0 INTRODUCTION

On June 19, 1987 Conestoga-Rovers & Associates Ltd. (CRA) submitted to the Regional Municipality of Hamilton-Wentworth (RMHW) a four Item proposal for engineering services to implement site monitoring control programs for the Upper Ottawa Street Landfill Site. To-date CRA has been awarded Item I, the installation of multi level monitoring devices and Item II, an environmental monitoring program. This report, entitled Site Assessment, presents the results of an initial site inspection which was described in the RMHW's Request for Proposal (RFP) under Item I. The purpose of the initial assessment was to determine existing surface conditions at the Upper Ottawa Street Landfill and to establish the necessary remedial works required for erosion control and associated site stabilization. Following the assessment, a report and accompanying site plan which reviews site conditions and specific areas of concern was to be prepared in a style suitable for field personnel to use while conducting corrective works.

For the purpose of conducting remedial works in the field, a summary of the site assessment is presented in tabular form (Table 1.1) and is accompanied with a site plan (Plan 1). Both general and specific areas of concern are identified on Table 1.1 and on Plan 1.



TABLE 1.1

## SITE ASSESSMENT OF SURFACE CONDITIONS

## UPPER OTTAWA LANDFILL SITE

Area	Description	Proposed Remediation	
		Surface Conditions	Remediation
1	<u>Top of Landfill</u>	<ul style="list-style-type: none"> <li>- everything above 215 m contour in the central portion of the site</li> <li>- generally flat, areas of settlement</li> <li>- high potential for surface water ponding and infiltration (leachate production)</li> </ul>	<ul style="list-style-type: none"> <li>- surface water ponding</li> <li>- inadequate surface cover</li> <li>- steel waste exposed</li> <li>- no vegetative growth over 25-50 percent of surface</li> <li>- regrade with the highest point in the center and the sides sloped to a minimum of 3% using a <sup>clay</sup> soil with a permeability of 10 cm/sec.</li> <li>- imported soil should be compacted to achieve a minimum of 95% relative Standard Proctor Density</li> <li>- place a minimum of 10 cm of topsoil and re-seed with grass seed.</li> <li>- all undisturbed areas should be lightly scarified to a depth of 3.0 cm prior to seeding.</li> </ul>
2	<u>North Mound</u>	<ul style="list-style-type: none"> <li>- top of north-west portion of landfill</li> <li>- well graded</li> <li>- good vegetative cover of grasses</li> </ul>	<ul style="list-style-type: none"> <li>- two localized non-vegetative</li> <li>- re-topsoil to a thickness of 10 cm</li> <li>- re-seed with grass seed.</li> </ul>
3	<u>North Slope</u>	<ul style="list-style-type: none"> <li>- area between Area 1 boundary and Red Hill Creek</li> <li>- currently the majority of the toe of slope is supported by a concrete retaining structure adjacent to Red Hill Creek</li> <li>- currently a feasibility study is being undertaken to evaluate leachate collection/control along the perimeter of Area 3</li> </ul>	<ul style="list-style-type: none"> <li>- all surface remediation proposed below should be incorporated into the remediation program associated with the anticipated construction of a leachate collection/control system</li> </ul>

continued....



TABLE 1.1 (cont'd)

Area	Surface Conditions	Description	Proposed Remediation
3 cont'd.	steeply sloped between access road and the toe of slope	area is intersected with erosional rills varying between 10 cm and 45 cm in depth	<ul style="list-style-type: none"> <li>- fill in erosion rills with a clay soil with a permeability of 10 cm/sec.</li> <li>- seeps should be contained by future leachate collection/control system</li> <li>- due to steep slopes short term remediation with clay patches is not economically viable.</li> <li>- topsoil with a minimum of 10 cm. stabilize slope with an erosion control vegetative mat.</li> </ul>
4	leachate seeps are predominant along top of retaining structure and are discharging into the creek.	large areas of exposed steel waste with no vegetative growth	<ul style="list-style-type: none"> <li>- leachate seepage along toe of slope on all three sides</li> <li>- refuse exposed along slope face on east and south slopes</li> <li>- portions of east, south and west slopes severely eroded.</li> <li>- includes remainder of site</li> <li>- existing leachate collection system around perimeter</li> <li>- a number of french drains currently tie the lower slope into the collection system.</li> <li>- gas vents are presently installed along east and south slopes</li> <li>- dig out and connect by french drain (constructed to the dimensions of 0.6 m by 0.6 m) to existing collection system</li> <li>- install drains at regular intervals (every 30 meters) perpendicular to the existing collection header</li> <li>- french drains should be located in the top of the refuse directly beneath the existing cover soils</li> <li>- the french drains should be extended up to meet the 195 contour on the east, and approximately to the 197 m contour along the south slope</li> </ul>
4	East, South and West slopes		



TABLE 1.1 (cont'd)

Area	Description	Surface Conditions	Proposed Remediation
4	Top of Landfill	East, South and West Slopes	<ul style="list-style-type: none"> <li>- regrade to fill in erosion rills and cap with a minimum of 0.6 m of clay (10 cm/sec) to secure the exposed refuse.</li> <li>- topsoil with a minimum of 10 cm and secure with an erosion control vegetative mat which consists of grass and crown vetch.</li> </ul>



## 2.0 SITE ASSESSMENT

### 2.1 GENERAL

On September 30, 1987, CRA visited the Upper Ottawa Street Landfill Site to conduct a site inspection to assess the existing surface conditions. This assessment of the existing surface conditions would allow for the development of a remedial work program required for erosion control and associated site stabilization.

Upon arrival CRA was met by Mr. G. Dykman (RMHW) who supplied a topographic map of the site. Walking the entire site, CRA personnel used the topographic map to plot both specific areas of concern and general site conditions. The plan is enclosed (Plan 1).

During the site visit it became apparent that the following types of conditions exist at the site:

- septic odour;
- erosional rills;
- areas with no vegetative growth;
- leachate seeps;
- poor grading - both steep slopes and flat areas;
- refuse break through;
- insufficient refuse cover.



Some of the above mentioned conditions are predominant in specific areas and others are more typical of the entire site. Since the existing site monitoring controls vary at the site, the most appropriate remedial action recommended varies not only with the type of condition but also with the particular area of the site which is affected.

For the purpose of discussion, therefore, the landfill site has been subdivided into four different areas (refer to Plan 1) which are as follows:

Area 1 - Top of Landfill

Area 2 - North Mound

Area 3 - North Slope

Area 4 - East, South and West Slopes

A description of the observations made in each area are included herein. The observations are illustrated on Plan 1 and summarized on Table 1.1.

## 2.2 AREA 1 - TOP OF LANDFILL

As shown on Plan 1, this area generally encompasses the area above the 215 m contour, and represents the central plateaued portion of the landfill.



Area 1 is relatively flat with no slope, and in some areas settlement has created depressions where surface ponding occurs. The no slope and ponding conditions increase surface water infiltration into the refuse and consequently leachate production. Vegetative cover is sparse, not well established and consists mainly of weeds and wild flowers. It is estimated that between 25 and 50 percent of the surface has no vegetative cover exposing the steel waste (slag) which was placed as final cover in this area.

#### 2.3 AREA 2 - NORTH MOUND

The top of the north mound, located north of the central access road, is well graded and supports a thick grass cover. The surface in Area 2 is in the best condition of all areas on the landfill site and except for two localized no-growth patches requires no remedial work on the surface condition.

#### 2.4 AREA 3 - NORTH SLOPE

The north slope includes the entire length of the Landfill located adjacent to the Red Hill Creek. Much of the toe of the slope along the creek has been stabilized with a concrete retaining structure.



Presently there is no leachate collection/control system in place in Area 3, although the RMHW has presently awarded a leachate collection feasibility study for this area of the site.

The most notable surface characteristics of Area 3 are the steep 1:1 side slopes rendering vehicular access extremely difficult in the present state. The side slopes are eroding and scattered with no-growth patches. As indicated in the legend of Plan 1, most of the large areas identify where vegetation is sparse but do not necessarily indicate that the area is entirely bare. Erosional rills intersect the ground surface along base of the slope at approximately one metre intervals. The limits of the erosion affected areas is outlined on Plan 1. Although refuse was not exposed at the surface in Area 3, except in one small area in the east corner, refuse was observed to be exposed in the deep erosional rills (approximately 0.5 m deep).

As seen on Plan 1, leachate staining was noted along the steep slopes (primarily below the 200 m contour) and observed almost continuously over the surface of the concrete retaining structure. The occurrence of active leachate seeps was more numerous at the extreme east and west ends of Area 3 although the two largest seeps were observed in the central portion of Area 3 (see Plan 1). During CRA's site inspection, the site conditions were dry and staining on the retaining



wall suggests that during wetter conditions leachate seepage is more active than that observed on September 30, 1987.

In addition to the erosion and seepage, a septic odour was detected throughout most of central portion of Area 3, where a large non-vegetated patch is located.

## 2.5 AREA 4 - EAST, SOUTH AND WEST SLOPES

Area 4 includes the remainder of the site which encompasses the east, south and west side slopes. Although large, this area is discussed as one because the existing surface conditions and the recommended remedial measures are similar. This area is presently serviced by a shallow leachate collection system located along the perimeter toe of slope.

Along the lower half of the east and west landfill slope (below the site access road) refuse is exposed intermittently at the surface. The refuse exposure becomes more consistent along most of the south slope in line with a row of existing gas vents. Erosional rills (approximately 0.15 m deep) also expose refuse in the south west corner of the site.



As would be expected, erosion in Area 4 is seen along the steep slopes where there is no vegetation. The non-vegetated spots appear to be the result of insufficient cover material and topsoil to maintain a vegetative cover. Construction of the existing French drains installations and gas vents may have caused disturbance and under erosion of the surface of the east and south slopes.

No growth areas delineated on Plan 1 in Area 4 generally have exposed refuse at the surface along the east and south slopes and exposed steel wastes (slag) on the west slope.

Although few active leachate seeps were observed in this area, due to the exposed refuse and areas of insufficient cover it is suspected that seepage may be much more active during wetter periods of the year. In fact it is suspected that the large areas of concentrated erosional rills may have been caused by seepage activity.

On the west slope, there is a large area which is dissected with erosional rills averaging 0.15 m in depth.



### 3.0 PROPOSED REMEDIATION

The specific conditions for which remedial action is recommended are summarized on Table 1.1 and are discussed in more detail below. Generally areas which obtain poorly graded slopes, erosional rills, and sparse vegetative cover can be remediated in a similar fashion. Corrective measures will vary the most, with respect to leachate seepage and vehicular access. As noted above leachate seeps were primarily found in Areas 3 and 4 with access extremely difficult in Area 3.

A leachate collection system presently exists around the perimeter of Area 4 and therefore remediation of leachate breakouts generally means increasing the effectiveness of the in-place collection system. In Area 3, which is adjacent to Red Hill Creek there is no collection system in place and due to the steep slopes and the proximity to the creek, leachate remediation will be more difficult. In fact, in the short term, leachate remediation is not economically viable for Area 3. Currently the RMHW has awarded a contract for a leachate collection feasibility study for this area of the landfill in which long term remediation will be proposed.



### 3.1 AREA 1 - TOP OF LANDFILL

As leachate production is currently a problem at the site (as noted by many leachate seeps along the toe of the landfill) it is recommended that Area 1 be re-graded to provide a minimum of a three percent grade.

Regrading should be conducted by importing, placing and compacting a low permeable clay soil (approx.  $10^{-7}$  cm/sec) for this purpose. The imported soil should be compacted to achieve a minimum of 95% relative standard proctor density. No excavation or excessive disturbance of the existing cover soils in this area should take place. Following regrading, the regraded area should be topsoiled with a minimum of 10 cm layer. The entire Area 1 should be seeded to establish a thick vegetative cover. All undisturbed areas should be lightly scarified to a depth of 3.0 cm prior to seeding. A heavy grass planted in this area will provide quick growth and minimize surface erosion on the gentle slopes. Regrading, topsoiling and seeding will increase surface water run off and, therefore, reduce leachate production.



### 3.2 AREA 2 - NORTH MOUND

It is recommended that the bare areas indicated on Plan 1, be covered with a 10 cm of topsoil layer, and be re-seeded with a heavy grass.

### 3.3 AREA 3 - NORTH SLOPE

Extensive remediation of slope-grading, erosion and leachate seeps is required along much of north slope. However, due to the pending construction of a leachate collection/control system and very difficult vehicular access in this area it is recommended that surface works be delayed until they can be incorporated into the remediation which will follow construction.

Normally clay patches could be placed to temporarily control leachate seeps and repair erosional rills. However, due to the steep slopes involved, the cost to provide equipment access to these areas is prohibitive. Consequently it is recommended that the potential leachate controls approved for this area be implemented as soon as possible. In conjunction with the remediation which will follow construction, it is recommended that the slopes be graded to fill in the erosional rills and capped with a minimum of 0.6 m of a low permeable clay ( $10^{-7}$  cm/s).



Topsoil should be placed at a minimum thickness of 10 cm, and an erosion control mat compatible for establishing a vegetative cover be used to establish ground cover. The vegetative cover in this area should consist of a mixture of grass and crown vetch. The grass will quickly establish a vegetative cover for short term protection with the crown vetch eventually (2 to 3 years) developing a heavy root mat for long term protection and low maintenance costs. Crown vetch although initially more expensive provides reduced long term maintenance costs for areas difficult to access with landscaping equipment.

### 3.4 AREA 4 - EAST, SOUTH AND WEST SLOPES

Due to the large areas of insufficient cover and exposed refuse it is recommended that the slope located below the existing access road be recapped. Prior to installing the cap measures should be taken to increase the effectiveness of the existing leachate collection system.

For Area 4 it is recommended that french drains be installed on maximum 30 meter intervals along the existing leachate collection header. The french drains consisting of 19 mm clearstone wrapped in filter fabric will relieve pore pressures subjected on the final cap and minimize future leachate breakouts. The french drains should



be installed perpendicular to the existing collection header extended up to meet the 195 m contour on the east slope, and approximately to the 197 m contour along the south slope. The french drains should be constructed to the dimensions of 0.6 m by 0.6 m and located in top of the refuse directly beneath the existing cover soils and tied into the collection gallery of the existing leachate collection system.

In addition the slopes below the access road should be regraded to fill in the erosion gullies preparatory to being capped with a minimum of 0.6 m of low permeable clay soil ( $10^{-7}$  cm/s) to secure the refuse and provide a membrane to establish a subsurface leachate flow regime into the french drains. Following the placement of the cap, the slopes will require a minimum of 10 cm of topsoil and seeding. It is recommended that an erosion control vegetative mat be used to establish growth on the steep slopes on the east, south and west slopes of the landfill. The vegetative cover should consist of a combination of grass and crown vetch.



#### 4.0 SUMMARY

For the purpose of conducting the recommended surface remediation, Table 1.1 and Plan 1 have been prepared to summarize the recommended remedial work.

In Area 1, regrading is required to improve drainage and reduce the potential for infiltration which increases leachate production. Regrading in this area can commence immediately. Following regrading, the top of the landfill needs topsoiling and seeding, however, this work should be deferred to the spring of 1988.

No erosional or leachate related concerns were observed in Area 2. Recommended remedial activity in Area 2 consists of some minor topsoiling and re-seeding to repair two small bare patches where steel waste is exposed and prone to erosion. Again, topsoiling and re-seeding in Area 2 should be delayed until the spring of 1988.

The north slope, Area 3, requires major remediation. Presently, the steeply sided slopes and insufficient refuse cover has resulted in erosion, unvegetated areas and leachate seepage. Due to difficult access and pending leachate collection/control system for Area 3, no surface remediation is proposed at this time, however, it is recommended that the leachate controls which



are designed during the feasibility study be implemented as soon as possible.

In Area 4, steep slopes and inadequate cover material has resulted in refuse breakout, severe erosion and leachate seepage. It is recommended that french drains be installed and connected the existing leachate collection system at regular intervals and the entire lower slope be regraded, capped, topsoiled and stabilized with an erosion control mat and vegetative cover. The installation of the french drains, regrading and placement of the cap can be initiated in the fall of 1987. Topsoiling and slope stabilization should proceed as soon as practical in the spring of 1988.

For specific details for each area, please refer to Table 1.1 and Plan 1 (enclosed).

All of which is Respectfully Submitted,

Brenda Phillips, B.E.S.

Gregory D. Ferraro, P. Eng.





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